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The United States Geological Survey (USGS) monitors the water resources in the United States including the Arkansas, White, and Red River Basins. Within these basins the surface-water quality and quantity measurement sites include about 430 continuous-recording stream-flow gages and more than 330 surface-water quality sampling sites, some of which are equipped with continuous monitors. In addition, a variety of other monitoring sites such as partial-record stations and precipitation stations are operated. The data collected are published annually and can be obtained from individual USGS District offices as soon as the figures have been verified. Many stations are equipped with data collection platforms and provide "real-time data" through satellite transmission.

The **Arkansas District** operates 84 continuous-recording streamflow gages, 23 partial-record gages, 10 stage-only gages, 63 crest-stage gages, 1 reservoir gage, 51 rainfall gages, and 46 surface-water quality stations (9 of which have continuous recorders) in the Arkansas, White, and Red River Basins. Ground-water levels in these basins are being measured in about 300 wells (11 of which have continuous recorders). Approximately 200 wells are sampled for water-quality determinations. A basic data report is available annually. In addition, ground-water data and potentiometric surface reports are published each year. These data are collected as a part of the USGS Collection of Basic Records program; ongoing cooperative work with State agencies, other Federal agencies, and various local governments; and in support of both the Arkansas River Compact Commission and the Red River Compact Commission.

Several interpretive investigations are ongoing in Arkansas. Existing ground-water flow models of the Mississippi River Valley Alluvial and Sparta Aquifers are being updated and recalibrated and conjunctive use optimization models developed. The Alluvial Aquifer is a very important source of agricultural and irrigation water and is in hydraulic connection with the lower White and Arkansas Rivers. The Sparta is a primary source of water for industrial and municipal use. Both aquifers have been over pumped and are experiencing massive cones of depression in some areas. Public drinking water supplies are being assessed and their potential susceptibility to contamination is being analyzed in a source water assessment project. A computer model of hydrodynamics, and dissolved oxygen in Beaver, Table Rock, Bull Shoals and Norfork Reservoirs is being constructed to predict probable impacts of proposed minimum flow changes. Water-quality data is being collected to calibrate a water-quality model for Beaver Reservoir. Stream flow and constituent flux is being investigated in the Buffalo River and two of its major tributaries. A study is planned to develop predictive equations to estimate time of travel for stream reaches. Interpretive reports related to these projects are available upon request.

The Ozark Plateaus National Water-Quality Assessment (NAWQA) Program, headquartered in Arkansas, includes portions of Arkansas, Kansas, Missouri, and Oklahoma. Technical reports and fact sheets on nutrients in surface water; pesticides in surface water, bed sediment, and

tissues; pesticides and nutrients in ground water; radium and radon in ground water; fish communities and their relation to environmental factors; and habitat data associated with surface water sites have been published. A lay reader report and fact sheet summarizing the findings of the water-quality investigations conducted between 1992-1995 in the Ozarks also has been published. Monthly sampling for nutrients, pesticides, and common constituents continues at two surface-water sites in the White River Basin. The Ozark Plateaus NAWQA high-intensity phase is planned to restart in 2004.

In the Arkansas River Basin of **Colorado**, a program of ground-water quality monitoring and evaluation of hydrogeology at the U.S. Army Pueblo Chemical Depot is in progress. Data are being collected to compare annual variations for the power consumption coefficient method and totalizing flow meters for estimation of ground-water pumpage from the Alluvial Aquifer along the Arkansas River in Colorado. A study to evaluate high water-table in the Terrace Alluvial Aquifer on St. Charles Mesa southeast of Pueblo is complete and final report preparation is in progress. An evaluation of trends in precipitation, streamflow, and channel erosion downstream from Colorado Springs is documented in USGS WRIR 00-4130 and USGS Fact Sheet 136-00. A hydrogeologic study of the shallow unconsolidated-rock aquifers in the upper Arkansas River Basin from Buena Vista to Salida, Colorado, began the summer 2000. A study to quantify losses from irrigation ditches along the Purgatoire River downstream of Trinidad Reservoir began the summer 2000.

The USGS currently operates 69 recording streamflow gages and 3 gages on reservoirs within the basin. All streamflow stations are equipped with satellite telemetry, which allows near real-time access to the data through the World Wide Web. Continuous recording water-quality monitors are operated at 12 sites. Periodic water-quality data are collected at 35 surface-water sites, 6 sites in Pueblo reservoir, and 180 wells. Suspended-sediment data are collected at 15 sites. Water-level measurements are made annually or more frequently in about 500 wells.

The National Water-Quality Assessment (NAWQA) Program, High Plains Regional Ground-Water Study started October 1998 in Kansas, Oklahoma, and the Texas Panhandle. In the first 2-years of the intensive data collection phase of the project, occurrence and distribution assessments and process-oriented studies were conducted. These studies included a broad-scale assessment of ground-water quality in the Ogallala Formation and the Quaternary deposits; an investigation of the effects of the land use on recently recharged ground-water quality beneath irrigated agriculture in the Ogallala Formation and in alluvial deposits beneath Wichita, Kansas; a water-quality comparison study, in which 15 public-supply wells were sampled and compared against 15 nearby domestic wells; a transect study within the Ogallala Formation along the Kansas/Oklahoma state line to examine vertical gradients in ground-water chemistry; and, unsaturated-zone studies to measure recharge rates and chemical and water fluxes beneath irrigated fields to the water table.

The **Kansas District** currently operates 60 continuous-record stream gages, 8 stage only gages, 4 lake gages, 7 crest-stage gages, and 19 ground-water level recorders in the Arkansas River Basin. Water-quality samples are collected at 10 of the streamflow stations and 20 short-term project

stations. Continuous-record water levels are logged and transmitted real time at 11 ground-water wells. Continuous-record water quality are logged and transmitted real-time from 5 surface-water stations. All continuous-record surface-water and ground-water stations are equipped with DCP's and most of the streamflow stations have raingages installed. Support for these data collection is provided by USGS, State agencies, other Federal agencies, various local governments, and the Arkansas River Compact Administration.

The Kansas District is collecting suspended-sediment samples at 5 sites in the Arkansas River Basin. These data and historical suspended-sediment data will be used to determine trends in suspended sediment concentrations in the 11 major river basins in Kansas. The cooperating agency for this study is the Kansas water office.

The Kansas District is continuing work on a cooperative study with the city of Wichita to collect and interpret water quantity and quality data for the Equus Beds Ground-Water Recharge Demonstration Project in south-central Kansas. The objective of this endeavor is to collect and interpret the data necessary to evaluate two ground-water recharge and recovery techniques, including the impacts on water quality, design criteria, and problems associated with infiltration of streamflow. Interpretation of the results of data collection activities and evaluation of the effectiveness of the recharge techniques are being published in a series of articles that can be found at http://ks.water.usgs.gov/Kansas/equus.

The Kansas District is continuing work on a cooperative study with the City of Wichita and Bureau of Reclamation to determine contribution of nutrients, total dissolved solids, and herbicides from Cheney Reservoir watershed. Numerous reports have been published and are accessible at http://ks.water.usgs.gov/Kansas/qw/cheney.

In 2000, the Kansas District began a 3.5 year study of ground water availability in the Lower Arkansas River Basin in cooperation with Kansas Department of Agriculture, Division of Water Resources. A ground-water flow model is under construction.

In **Louisiana**, the USGS operates 62 continuous-recording stream gages (16 continuous discharge gages, 46 continuous stage gages), 5 lake and reservoir gages, 13 crest-stage gages, 13 flood-profile gages, and 3 surface-water quality stations in the Red River Basin. As part of the Louisiana real-time monitoring network, 49 of the continuous gages have Data Collection Platforms (DCP's), and 34 sites have rain gages. Included in the real-time network are 14 stage-rain gages in the Caddo-Bossier Parish area near Shreveport, Louisiana, and 16 stage-rain gages in the Ouachita Parish area near Monroe, Louisiana. The Louisiana District operates a statewide ground-water-level and quality network of which 67 water-level sites and 27 water-quality sites are located in the Red River Basin. The Louisiana District is sampling 27 sites in the Ouachita Basin for pesticides and oil and grease over a six-month period. This work is being done in cooperation with the USEPA as part of TMDL (Total Maximum Daily Load) studies in the state.

The **Missouri** District currently operates 28 continuous-record streamflow gages, 4 lake gages, and 6 crest-stage gages in the White River Basin. Water-quality data are collected at 7 of the

streamflow stations and 35 project sites. Continuous-record water-quality data are logged and transmitted real-time from 18 surface-water stations. All continuous-record streamflow stations are equipped with DCP's and 15 of the streamflow stations have rain gages installed. Financial support for this data collection is provided by state agencies, other federal agencies, and city governments.

In **New Mexico**, within the Arkansas River Basin, the USGS operates 18 continuous-record streamflow gages, 4 lake or reservoir gages, and 3 water-quality sampling sites. In addition, data are collected at 4 crest-stage partial record sites. Ground-water data are collected at 1 continuous recording site, semi-annually at 10 wells, and at 5-year intervals at about 460 wells.

One interpretive investigation is nearing completion in the New Mexico District. To accommodate State Highway 555, the Canadian River near Raton, New Mexico, was channelized between mile markers 8 and 9 in the late 1970's. In 2000, the New Mexico State Highway Department (NMSHD) requested that the USGS engage in a study to document geomorphic changes over time in channelized portions of the Canadian River to determine the equilibrium conditions of the channel. The objectives of the USGS study are to determine the geomorphic response of the Canadian River to channelization and channel narrowing and to predict future changes in channel geometry. Acquiring information on channel geomorphic changes over time will provide the NMSHD with information on the geomorphic effects of channelization and narrowing, and the means to predict future changes in channel behavior.

Oklahoma is located within the Arkansas and Red River basins. The Oklahoma District collects surface-water and discharge data from 134 continuous recording stream gages, 16 lake and reservoir gages, and 25 other surface-water sites. Surface-water-quality data are collected at 20 continuous monitoring sites and 36 miscellaneous sites. Ground-water levels are measured at 3 continuous sites and annually at 350 wells.

The collective effort between the U.S. Army Corps of Engineers, Tulsa District; Oklahoma Water Resources Board; Oklahoma Department of Environmental Quality; and the U.S. Geological Survey (USGS), Oklahoma District has reinstated the remaining 23 surface-water stations out of the 42 stations discontinued by the Tulsa District Corps of Engineers in fiscal years 1998 and 1999.

The National Streamflow Information Program has provided Congressional funds to the USGS, has reinstated five sites, and totally funded two discontinued sites; Cimarron River near Buffalo, a discontinued Arkansas River Compact site, and Skeleton Creek near Lovell.

The High Plains National Water-Quality Assessment (NAWQA) Program started October 1998 in Kansas, Oklahoma, and the Texas Panhandle. The three components for the study are the aquifer water-quality characterization study, an investigation of the effects of the land use on ground-water quality, and an urban water-quality study in the Wichita, Kansas area. The report on the quaternary portion of the High Plains Aquifer has been published and the Water-Quality Characterization study is in review. Thirty ground-water wells have been installed and sampled

as part of the study to describe the effects of irrigated agriculture on the aquifer and 30 wells have been installed in Wichita, Kansas as part of an urban land use study.

The study to determine the effects on surface-water quality by oil production on the Osage Indian Reservation continues. The work involves stream sampling at 140 miscellaneous surface-water sites for possible oil field brine contamination from upgradient wells. The surface-water samples have been compared to nearby ground-water samples to determine if oil well brines have contaminated surface water. The final report is in review.

The reconnaissance of the hydrology, water quality, and sources of bacterial and nutrient contamination in the Ozark Plateaus Aquifer System and Cave Springs Branch of Honey Creek, Delaware County, Oklahoma, has determined surface and ground-water contamination from animal grazing, fertilizer application, poultry processing, and human waste. The report has been published.

Research continues at the Norman Landfill Research Site. New research involves the measure of the rate of decay and accumulation of contaminant on electron-acceptor compounds, such as clay, in test wells. An extensive field program is underway to test how aquifer permeability variations affect in-situ biodegradation rates. Initial tests with easily degraded organic acids showed differences in biodegradation patterns in zones of different permeability. Continuing work will examine patterns of contaminant compounds. Information can be viewed on the USGS, Oklahoma District home page at:

http://ok.water.usgs.gov/norlan/

The study determining streamflow statistics and peak discharge run off for Oklahoma is being prepared. This report will also contain estimated extreme peak potential for each site. Planned publication date is June 2001.

Global Information System (GIS) layers for the North Fork of the Red River Drainage Basin above Altus Lake and the Texas Panhandle containing the hydrologic cataloging units, digital elevation models, national hydrographic data set, and ground water and surface water hydrologic data in the USGS data base have been completed and provided to the Bureau of Reclamation for possible water-shed modeling. Water-quality samples are being collected at the North Fork of the Red River near Carter, Oklahoma, and analyzed for nutrients, pesticides, and common dissolved constituents.

The **Texas District** operates in the Arkansas and Red River Basins: 45 continuous record stations and 1 flood-hydrograph partial-record station. Four of the continuous record stations are in the Canadian River Basin (subbasin of the Arkansas River Basin) and the remaining are in the Red River Basin. Periodic chemical-quality data are available for 16 stations located in the Red River Basin and one site, Canadian River near Amarillo, in the Arkansas River Basin. Continuous record temperature and conductivity data are available for 12 stations located in the Red River Basin and one site, Canadian River near Amarillo, in the Arkansas River Basin.

Daily contents are being gaged for 17 reservoirs. Water-quality surveys are being done 3 times a year at Cooper Lake and Lake of the Pines. A reconnaissance survey for trace metals in bottom sediments of Wright Patman Lake was completed in the 1999 water year and a report of the findings will be published early in the 2001 water year.

Ground-water levels are being collected for 10 wells in the basin. These sites are instrumented with satellite telemetry equipment allowing the information to be immediately placed on the Internet. Water-quality samples will be collected at 50-60 wells during the summer of 2001 as part of the High Plains NAWQA study.

Water-quality data are being collected and analyzed for Texas Red River Authority's Clean Rivers Program monitoring plan. Over five years, an annual rotation of intensive water-quality monitoring in each of five subbasins in the Texas Red River and Canadian River basins is being conducted to characterize water quality and identify potential water-quality concerns. Efforts for this year will be concentrated in the Wichita River Basin of the Red River. A fact sheet "Assessment of Selected Water-Quality and Biologic Data Collected in the Wichita River Basin, Texas 1996-97," was published in September 2000. The 3rd and 4th fact sheets of this series detailing survey findings in the Pease River and the main stem of the Red River during 1998-99 will be published early in the 2001 water year.

The Texas District continues to work with the U.S. Army Corps of Engineers to evaluate the effectiveness of the Corps' salt control project in the Wichita River basin. The USGS is operating continuous monitors and collecting monthly samples at 9 sites in the Wichita River basin for this project. A 1996 USGS Water-Resources Investigation Report (WRIR 95-4288) states that the low flow diversion on the South Fork of the Wichita River is effective in removing salt from the base flow of the river; however, this effect is masked at Lake Kemp because of higher base flows from the North Wichita River which is currently uncontrolled. A major change has taken place in this project with plans being developed to raise the height of the dam at Truscott Brine Disposal Lake and flows from the middle and north forks of the Wichita River diverted to the existing Truscott Brine Disposal Lake thus eliminating the need for Crowell Brine Disposal Lake. An environmental impact statement has been completed by the Corps with further work in the basin depending on how the new administration views its findings.